What is pressure?
Normal Blood Pressure

The pressure of blood in the vessels when the heart beats: **systolic pressure**

The pressure between beats when the heart relaxes: **diastolic pressure**

- **High blood pressure**: 140/90 mmHg or higher
- **Prehypertension**: between 120-139 mmHg and/or 80-89 mmHg
- **Normal blood pressure**: less than 120/80 mmHg

**120/80 mmHg**
Pressure and Temperature Units

1 atm = 760 mmHg = 760 torr

= 14.7 psi = 101.3 kPa

K = °C + 273

°F = 1.8(°C) + 32
Boyle’s Law

When the amount and temperature of a gas are constant, the Pressure and Volume are inversely related.

\[ P_1 \times V_1 = P_2 \times V_2 \]

initial conditions     new conditions
Boyle’s Law

If a 4.0 L He balloon has a pressure of 10.0 atm, what is the new pressure if the volume is increased to 6.0 L?
How Breathing Works

Breathing In

Diaphragm moves down.

Breathing Out

Diaphragm moves up.

air inhaled

rib cage expanded

air exhaled

rib cage contracted
Charles’ Law

When the amount and pressure of a gas are constant, the volume and temperature (in Kelvin) are proportional.

\[ \frac{V_1}{T_1} = \frac{V_2}{T_2} \]

initial conditions new conditions
A breath of air (0.50 L) at body temp. (37°C) is expelled from your lungs into the chilly fall air which is 10°C. What is the new volume?
Gay-Lussac’s Law

When the amount and volume of a gas are constant, the pressure and temperature (in Kelvin) are proportional.

\[ \frac{P_1}{T_1} = \frac{P_2}{T_2} \]

initial conditions   new conditions
A sample of CO$_2$ gas has a temperature of 100.0°C and at 1.05 atm. What is the new temp. if the pressure is increased to 2.47 atm?
Dalton’s Law of Partial Pressures

\[ P_{\text{total}} = P_1 + P_2 + P_3 \ldots \]
Dalton’s Law of Partial Pressures

\[ P_{\text{total}} = P_A + P_B + P_C \ldots \]
More Gas Laws